Two heads are better than one: the discovery of electromagnetism

BY AMY MAST

Some discoveries are so big that it takes several of an era's best minds working together to achieve them. For example, today, scientists all over the world are working both together and competitively to figure out how and why superconductivity works, and how it can be applied to use energy more efficiently.

Almost 200 years ago, across several countries and without an e-mail inbox in sight, scientists were working this same way to explore the mysterious relationship between electricity and magnetism.

Ørsted: the explorer

If you had some friends over and accidentally made a scientific discovery, you'd probably show it to them and tell them all about it, right?

Not Hans Christian Ørsted of the Netherlands. In the fall of 1820, he invited some colleagues over to show them the way metal could conduct an electrical current. When he fired up the current, he noticed the needle on a nearby compass — on hand for a different demonstration — moved. No one had yet observed a relationship between electricity and magnetism, and Ørsted was stunned. He kept the finding secret for three months while he tried to figure out how and why his demonstration had affected the magnetic field of the compass.

Up until this point, only lodestones (naturally occurring stones with a high concentration of iron) and iron itself were known to give off a magnetic field. Ørsted replicated his finding and studied it intently, but couldn't come up with an explanation for the phenomenon on his own. He ended up publishing his discovery with no explanation.

Ampère: the explainer

The scientific community of the day went crazy trying to explain the phenomenon; over a hundred papers were published on the subject in the following seven years. At the head of the pack was French physicist and mathematics professor Andre-Marie Ampère.

Only a week after he learned of Ørsted's work, Ampère presented his own findings. He demonstrated that when two wires were placed parallel to one another, both carrying an electric current, they'd either be attracted to or repulsed by each other depending on which directions the currents were traveling. If both currents moved in the same direction, the wires would be attracted to one another. If the currents were moving in opposite directions, the wires repelled one another instead.

It sounds simple, but this finding proved the spark for the study of electromagnetism as a field of interest, and became one of the foundations of modern physics. Ampère also figured out how to quantify, or measure, the intensity of the interaction between different electromagnetic currents, and how to nail down the relationship between electricity and magnetism with an equation known as Ampère's Law.